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Comparison of MODIS and *SnowStar* Snow Maps in Scandinavia

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ABSTRACT

In this study, we look at the melt season in the spring of 2004 in the southern part of the Fenoscandia region, which includes Finland, Sweden and Norway, to determine the relative accuracy of the Moderate-Resolution Imaging Spectroradiometer (MODIS) snow maps as compared to the maps which employ a modified *SnowStar* algorithm. *SnowStar* is an operational snow-mapping system developed in Norway for mapping snow in Scandinavia. The *SnowStar* maps use 250-m MODIS data as input and a cloud mask which is tuned to the Fenoscandia region. Snow maps from MODIS produce global, daily maps using an automated algorithm which is not tuned to any particular land cover or set of cloud conditions. For the four dates studied, the preliminary assessment is that the regionally-tuned cloud mask of the *SnowStar* maps accounts for most of the difference in amount of snow mapped between map products.

INTRODUCTION

Algorithms have been developed using data from Earth Observing System (EOS) sensors to create geophysical products that are needed for modeling and monitoring studies. The Moderate-Resolution Imaging Spectroradiometer (MODIS) sensors on the Terra and Aqua satellites provide global-scale geophysical products such as land cover, albedo, snow and sea ice cover. The algorithms are designed to be automated and many of the resulting products have been validated (see Justice and Townshend, 2002).

The MODIS global snow-map products (http://modis-snow-ice.gsfc.nasa.gov) are available at different spatial resolutions to serve different user groups (Hall et al. 2002) and are archived and distributed through the National Snow and Ice Data Center (NSIDC) (Scharfen et al. 2000). The *SnowStar* map products may be produced in an automated or semi-automated mode using Advanced Very High Frequency Radiometer (AVHRR) data. A new version of the algorithm utilizes 250-m resolution MODIS data.

RESULTS

A comparison of the *SnowStar* and MODIS maps for 12 April 2004 is shown in Figure 1. The *SnowStar* map shows that 24.7% of the scene is snow covered, while the MODIS map shows that 19.2% of the scene is snow covered. If we employ the same cloud mask on both maps (cloud masks from both the MODIS map product and from the *SnowStar* map) and inland water from the MODIS product, using the *SnowStar* land/water mask on both maps, the *SnowStar* map shows somewhat less snow as compared to the MODIS map product - 15.62% of the scene is snow covered while the MODIS product shows that 17.75% of the scene is snow covered (Figure 2). Figure 3 shows the results for each of the four dates studied. Results for the four dates using the overlays on both the *SnowStar* maps and MODIS map products are summarized in Figure 4. These preliminary results show that the amount of snow mapped is similar when the cloud mask, land/water mask and inland water mask are the same on both maps.

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